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28 November 1989

Joshua Lederberg, President
The Rockefeller University
1230 York Avenue
New York NY 10021-6399

Dear Professor Lederberg:

Thank you for your note and reprint. I had not known about a correlation between the F plasmid and motility.

Alan Wolfe is now an Assistant Professor of Microbiology at Loyola University Medical Center, Maywood, Illinois. I am sending him copies of our correspondence and your reprint.

The main problem with the swarm assay is that it involves growth. Cells invade new territory, either at random or in pursuit of a gradient, and then divide. One trivial possibility, that would have to be ruled out, is that F^- cells grow more rapidly than F^+ cells. Or, as suggested in your note on the cover of the reprint, the sex pilus might interact with the flagella, changing the way in which the cells swim. A third possibility is that the sex pilus interacts with the agar, acting as a sea anchor that slows cells down.

Unfortunately, all of the strains of *E. coli* K12 that we have used in studies of motility (derived from Adler's AW405 or Parkinson's RP437) are F^-. AW405 has Type I pili and RP437 does not. However, I am not aware of any differences in motile behavior that depend on Type I pili. We have not studied the matter systematically.

We happen to be at work on an assay in which cells move between gently stirred solutions in two chambers separated by a glass capillary array (a microchannel plate of the sort used in image intensifiers). If the plate is thick enough ($\geq$ 0.5 mm), cells in pursuit of a gradient outrun cells wandering through at random, and one can measure drift rates or diffusion coefficients directly. Cells that reach the other side are counted by a light-scattering device (utilizing an infrared laser diode) sensitive to about 10^3 cells/ml. So we could measure the diffusion coefficients of otherwise isogenic pillated or non-pillated strains. But if the differences are small, they could be outweighed by differences in adsorption to glass. The adsorption of cells of strain AW405 to the capillary walls can be reduced to manageable levels by the addition of polyvinylpyrrolidine (0.1%, 40 kD).

Should we learn anything more about pili, especially sex pili, I will let you know!

p37
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I enclose a reprint of a talk that I gave a year and a half ago at Cold Spring Harbor, which summarizes what I find particularly interesting about the motile behavior of *E. coli* K12.

Yours sincerely,

Howard C. Berg
Professor of Biology

HCB/sb

P.S. If other reprints are available on your early work on motility that include photographs of trails or of swarms (that Xerox poorly), I would be very pleased to have them.